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ABSTRACT

Computer-based education has been extensively studied in the last two decades. Such studies have shown that applications of computers, such as computer-aided instruction (CAI) and computer-managed instruction (CMI), can be useful in some facets of education, especially teaching basic skills and for drills. CAI is the use of a computer to help present instruction and/or to interact with a student to enhance learning. It can employ as many as four instructional formats: tutorial, drill and practice, dialogue, or a combination of any or all of these. CMI can be defined as a total educational approach which can provide the teacher or trainer with a management information system--a computerized means of testing, record keeping, and decision making, that assists effective administration, optimized learning, and individual learner management. CAI has the virtues of aiding drill and assisting in individualizing instruction. For a variety of subject areas and grade levels, CAI has been shown to be cost effective. At this time there is little use of CAI in adult education, especially in adult basic education (ABE), but systems employing CAI and CMI have the potential in the near future for dramatically extending educational opportunities to undereducated adults. Homebound programs are possible, and the systems' flexibility will permit greater individualization of ABE programs. (KC)

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COMPUTER ASSISTED INSTRUCTION IN ADULT BASIC EDUCATION

by

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COMPUTER ASSISTED INSTRUCTION IN ADULT BASIC EDUCATION

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Computer based education (CBE) has been extensively studied over the last two decades. It has been described or defined in various ways but generally refers to a learning environment in which the computer is the main source of management and instruction. (Lau, 1979) CBE may also be imprecisely designated computer assisted instruction or computer aided instruction (CAI), computer managed instruction (CMI), computer based instruction (CBI), computer assisted learning (CAL), or computer augmented education (CAE).

The purpose of this study is to consider the current status of computer-based education and its use in (and implication for the future of) adult basic education. More specifically, application of computers such as CAI and CMI will be examined. Concerns such as efficiency and effectiveness of CAI and cost-effectiveness will be studied. Use of CAI and CMI in adult education contexts will be reviewed.

Distinguishing Between CAI and CMI

Several references have identified the differences between computer assisted instruction and computer managed instruction. (Fromer, 1972; Lau, 1979; Moursund, 1980) Lau defines CAI as "...an on-line learning process in which a learner interacts with a computerized delivery system (through a computer terminal and keyboard) that assumes a direct instructional role. Within a CAI lesson, the learner is allowed to progress at his/her own rate. The

depth and range of instructional materials can be adjusted to the learner's individual knowledge, background, and goals. The sequence of the instructional presentation can also be changed according to the learner's preferences and needs. Immediate feedback can be provided after each performance." (Lau. 1979, p. 24) Moursund more simply says that CAI "...is the use of a computer to help present instruction and/or to interact with a student to enhance learning. Examples range from simple drill and practice to sophisticated interactive tutorial systems." (Moursund, 1980, p. 24)

CAI can employ as many as four different instructional formats: tutorial, drill and practice, dialogue or a combination of any or all of the preceding. When tutoring, the computer presents new information to the student, formulates a question, and then moves to the next segment. For drill and practice the computer generates skill exercises previously learned. Dialogue emphasizes comprehension and both the student and the computer may function in question and answer roles.

CMI is defined as "...a total educational approach in which a computer-based management system is used to support the management functions performed by the teacher or trainer. The most important aspect of CMI lies in its ability to provide the teacher or trainer with a management information system capability (providing information to support the operations, management, and decision-making functions) to be used within the context of a total educational or training program. Specifically, CMI is a computerized means of testing, record keeping, and decision-making that assists effective administration, optimized learning, and individual learner management." (Lau, 1979, p.24) Again more succinctly, Moursund defines CMI as "...the use of the computer as a record keeper, diagnostic tester, test scorer, and

as a prescriber of what to study next." (Moursund,1980, p.24)

According to Lau, when comparing and contrasting CMI and CAI in terms of diagnostic and prescriptive functions the following can be asserted, "CMI utilizes an on-line diagnosis, prescription, and content presentation. CAI delivers learning materials through computer terminal displays and at the same time carries out diagnosis of the learner's learning. CMI, on the other hand, presents test to the learner and, in cases where the learner's performance is undesirable, assigns prescription off-line. CMI develops a scheduling system for optimally matching students with learning resources. This function CAI does not have. Futhermore, the overall development of a learner's record system with a CMI course provides learning records to learners, trainers, teachers, counselors, and CMI development personnel." (Lau, 1979, p.24)

Further distinctions between CAI and CMI can be considered relative to seven dimensions or factors. (Fromer, 1972) Factors such as student/computer interaction, programming languages, batch vs. incremental processing, real-time tolerance, on-line requirements, decision-making requirements and lesson material storage are elments which offer the potential for establishing differences between CAI and CMI.

Efficiency and Effectiveness of CAI

The literature on efficiency and effectiveness of computer assisted instruction is rather extensive, although by no means conclusive. (Lau, 1979; Lippey, 1975; Moursund, 1980; Solomon, 1974; Vinsonhaler & Bass, 1972) One author feels that students working on drill and practice appreciate the computer's patience. Students claim that there is no embarrassment, no feeling of delaying the teacher or other learners and no knowledge of the

rate at which work is being accomplished (such as slowness).

Of paramount importance to the value of CAI and CMI is individualized instruction. The merits of individualized instruction are well known and CAI's particular ability to provide at least some elements of such make it a valuable resource for any educational program. (Lippey, 1975)

One example of an experiment which tested efficiency and effectiveness was done in a college-level accounting principles course. (Solomon, 1974) Students in the experimental group were instructed via a computer terminal. Solomon concluded that "...CAI could present material in less time than the traditional lecture approach with little sacrifice in students' material comprehension. With careful utilization of these freshly created time slots, CAI is capable of presenting a more sound, more compact and more interesting program of study for the student." (Solomon, 1974, p.41)

Relative to the impact of CAI drill and practice on student achievement ten major studies were summarized a decade ago. (Vinsonhaler & Bass, 1972) The authors concluded after reviewing ten major studies that "...the effectiveness of CAI over traditional instruction seems to be a reasonably well-established fact in drill and practice for both mathematics and language arts, when performance is measured by SAT- and MAT-type tests. In the field of elementary education, there appears to be little reason to doubt that CAI plus traditional classroom instruction is usually more effective than traditional instruction alone in developing skills - at least during the first year or two." (Vinsonhaler & Bass, 1972, p.32)

A strong advocate of CAI drill and practice activities is Patrick Suppes, an acknowledged expert on CAI. He has emphasized that "...mastery of basic skills is the prime function of computers." (Suppes and Albrecht, 1973, p.48)

Cost-Effectiveness of CAI

A prevailing concern of all programs is cost factors. Systems which are comparable in many respects will be evaluated cost wise. Usually the least expensive system is selected for implementation. More expensive systems will be selected only when they possess some special advantage such as greater effectiveness or time savings.

Cost-effective applications of CAI and CMI have been found to occur. However, cost-effectiveness will not automatically occur just because computers are being used in an instructional context. Varying accounting methods alone can cause significant differences between seemingly identical situations. A more subtle source of variance can result from factors such as whether a program is designed for poorly motivated lower elementary students or highly motivated college bound seniors.

For a variety of subject areas and grade levels, CAI has been shown to be effective. Cost-effectiveness has been demonstrated for CAI "... in areas of high educational cost, such as medical school, certain aspects of military training, and working with mentally-handicapped or learning disabled students. As computer costs continue to decline and better CAI materials are developed, we can expect CAI to play an increasing role in all of education." (Moursund, 1980. p. 26)

CAI and ABE

At this time there continues to be little use of CAI in adult education, especially adult basic education. The situation, though somewhat different, seems to be similar to that noted by Stanley M. Grabowski in 1972. He commented that there was no widespread use of computers in adult education. The reasons, he suspected, were cost factors of computers and complexity for use by adult students. (Grabowski, 1972)

Computer costs are steadily dropping in a manner similar to that of calculators. Input and output for today's computers are usually a typewriter keyboard and television viewing screen. Some research findings indicate that some computer installations did not impede learning. (Cole, 1971)

Some of the contemporary applications of CAI have been in special adult settings, such as prisons. (Diem & Fairweather, 1980; Siegel, 1978-79) Others have been in more conventional adult education contexts and may have been directed to special groups or have concentrated on certain content or skill areas. (Caldwell, 1980)

The need for extending adult education services continues to exist. Literally millions of adults in the U.S. are without an adequate education (elementary and secondary education or its equivalent). Programs which would make adult education more accessible could possibly alter this situation dramatically.

Basic to understanding why so many adults remain without an adequate education or life-coping skills is knowledge of the nature of the undereducated adult. Many of these persons find themselves in the lower, middle-class and/or lower class socioeconomic strata of society. They suffer the deprivation of many opportunities available to a substantial percentage of the general population. The basics of food, shelter, and clothing are often just minimally available. Many who work have little discretionary income and many must depend on government programs for subsistence.

In a large number of cases the ability to participate in either full-time or part-time adult education programs is largely dependent upon access to transportation. Additionally, many are reluctant to leave the security of

their home, especially if they must enroll in a nighttime program. Certain handicaps may further restrict activities outside of the home or institutionalized settings. These factors, along with several others, have seemed to substantially limit enrollment in academic adult education programs.

Implications for the use of CAI in adult education are two-fold. One consideration should be directed toward the potential for enhancing the quality of the delivery system, i.e., increased effectiveness and efficiency. Any format which could result in improved student learning with a time savings should be considered for implementation.

The other factor which makes CAI especially attractive for academic adult education is the capability of the technology to provide services in an innovative manner. Continuing technological developments are making CAI available for implementation in a homebased manner. Through telephone line communications attached to a home monitor it is now possible for a student to interact directly with a computer program in a centralized location. In this way it would be possible for an instructor to control or influence the educational program of an ABE student by telephone and/or through face-to face contacts in either a home environment, center-based program or part-time class. Through a CMI component, the computer could also assist the teacher in monitoring (and diagnosing) the educational progress of each student.

A few school systems have implemented some type of computer assisted instructional program. Some are in very restricted environments. Very few have involved general ABE audiences. One publisher distributes a computer software and hardware package which has been implemented in some adult education programs (Computer Curriculum Corporation, Palo Alto, California). Two

specific programs are designed for adult education purposes, the Adult Skills Course for ABE and the GED Course for GED students. The number of applications of these programs across the country has not been determined from the available literature.

At least one experimental demonstration project is currently studying the feasibility of implementing CAI on a homebased basis. (Broussard, 1980) The basic developmental work is now being done with computer facilities which are used during regular school hours by elementaty school students. The appropriateness of the ABE curriculum is being studied and a curriculum guide for instructors is to be prepared for future use in CAI endeavors. In the immediate future the feasibility of home use of CAI with ABE students (and GED students) is planned as a special adult education project.

The author contends that systems employing CAI and CMI have the potential in the near future for dramatically extending educational opportunities to under-educated adults. Adult basic education via a homebased or institutionalized system utilizing a CAI or CMI system can reach participants who have previously not been able to or who have not considered participating in adult education programs. Through the application of continuing technological developments, CAI and CMI programs will permit greater flexibility and individualization of ABE instruction and the efficient monitoring capability necessary to sound program operation.

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